Laboratory Safety Program

Of

Health Science Research Center

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1. Introduction and Scope:

The laboratory environment can be a hazardous area to work. Workers are exposed to many potential hazards including chemical, biological, physical and radioactive hazards, therefore; laboratory safety program must be established to protect health and safety of its employees, students and visitors, in accordance with International standard. The Laboratory Safety Program has been developed by safety officer, and is intended to assist health science research center environment to reduce any risk associated with lab activities.

The major elements of the lab safety program are:

- The adherence to appropriate design criteria when designing and constructing a laboratory facility (Laboratory Construction Design Standards).
- Determination of responsibilities to laboratory supervisors and employees.
- The training and education of laboratory employees and visitors.
- Personal protective equipment and use of appropriate laboratory safety equipment
- Labeling and information.
- Provide a written safety procedure for activities involving hazardous work in each lab unit.
- Waste disposal management system.
- Emergency response.
- Exposure Incident.

Scope: This program applies to all activities in the laboratory where there exists the potential for personal injury or property damage and to all those identified as laboratory supervisors/principal investigators and laboratory employees.

2. General Safety Rules:

- Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in lab areas where specimens are handled.
- Food and drink are not stored in refrigerators, freezers, cabinets, or on shelves, countertops, or bench tops where lab materials are stored or in other areas of possible contamination.
- Keep pens and pencils out of your mouth.
- Appropriate Personal Protective Equipment (PPE) must be used continuously in the lab area.
- Never mouth pipette, Mechanical pipetting devices must be used for pipetting all liquids.
- Frequent hand washing is highly an important, which should be practiced after contact with any specimens and laboratory materials.
- Laboratory work surfaces/bench top must be disinfected daily and after a spill of blood or body fluid with a 1:10 dilution of Clorox in water.
- Know where the nearest eyewash station is located and how to operate it.
- You should handle all patient samples as potentially biohazards materials.
- Proper handling of sharps.
- Label all specimen and any preparation materials with isolation stickers.
- All reagents should be kept in the proper storage facilities.
- Know where all fire exits, fire extinguishers and fire alarms are located.
- Know how to properly operate fire alarm and fire safety equipment.
- The use of extension cords is prohibited.
- Never operate electrical equipment with fluid spillage or with wet hands.
- Centrifuges should not be used without the covers completely closed.
- Any type of accident should be brought to the attention of a nearest person of the area.

i. Laboratory Construction Design Standards:

All health and safety considerations was evaluated at the time of lab construction in accordance with Laboratory Construction Design Standards, these include:

a. Basic Elements:

- Fire/Life Safety Code compliance.
- Determine nature of laboratory ventilation control systems and overall driver: fume hood exhaust, or minimum air changes.
- Provide direct and unobstructed paths to exits.
- Provide reasonable accommodations to workers with disabilities.
- Doors, hallways of sufficient width for standard lab carts and equipment moves.
- Provide infrastructure equipment needed for an emergency eyewash and safety shower.
- Automatic fire suppression is provided.
- Address personal and property security in overall building and area designs.

b. Ventilation:

- Maximize the percentage of fresh air provided.
- Separate general and fume hood exhaust systems.
- Locate supply air intakes distant from potential sources of contamination, including fume hood stacks and exhaust from portable gas powered tools.
- Hoods have chemically resistant surfaces and finishes.
- Hoods installation contain water, electric, and drain connections, also install gas service connection and house vacuum.
- Lights are easily accessible from outside of hood.

c. Lab and Hall Doors:

- Maximum appropriate fire rating possible.
- Glass doors and viewing ports are provided to facilitate interior observation in event of accident.

d. Walls, Flooring and Ceilings:

- All wall and ceiling are easy to clean and decontaminate.
- It is resistant to chemicals of many different kinds range ranging mild detergents, to strong acids.

e. Plumbing:

- Reverse osmosis water implemented and connected to the main tank.
- Below-slab piping is avoided.
- Sink made by polypropylene to be anti-corrosive and contamination.
- Corrosion resistant piping was installed on drains originating from laboratory sinks in order to protect the initial portions of the waste system from degradation due to trace chemicals.

f. Gas System:

- Fixed CO2 gas system is generally executed to provide extended gas service.
- Gas cylinders storage and use areas have adequate accessibility and permanent securing means by chains or strapping.

g. Lab Furniture and Furnishings:

- Prefer bench tops of chemical resistant, non-porous black epoxy top.
- Smooth, non-porous, easily cleaned surfaces.
- Accessibility below furniture for cleaning in event of accident or spill.
- Lab chairs - 5 leg style, non-porous fabric coverings to facilitate cleaning and prevent absorption of infectious, hazardous chemical, or radioactive materials.

h. Electrical Issues:

- Maximize number of separate circuits to avoid overloads.
- 220V power available, and supplied as needed especially in equipment rooms.
- Emergency/backup power - provide a basic backbone service.

i. Tissue/Cell Culture Rooms:

- Separate from surrounding lab units with door inward opening.
- Floor penetrations sealed to prevent liquid migration.
- Hand washing sink inside room, near the door.
- Avoid placing biological safety cabinets below air supply vents.
- Hard-plumbed, Mani folded gas delivery system for incubators.

j. Hallways:

- Non-carpeted, non-porous., easily cleaned surfaces (vinyl tiling).
- Sufficient width and height to accommodate pedestrian and equipment traffic.

ii. Determination of Responsibilities to Laboratory Supervisors and Employees:

The effectiveness of the Laboratory Safety Program is directly related to the realization of responsibilities by all pertinent parties. The responsibilities within the Health Science Research Center for the implementation of this program:

1. **Head of Health Science Research Center have the following Responsibility:**
   - To identify laboratory manager, all laboratory units' supervisors and ensure that they clearly understand their duties and responsibilities as defined in this program.
   - To ensure that all components of the laboratory safety program are implemented in the department.

2. **Laboratory Manager / Laboratory Supervisors Responsibility:**
   - To implement this program in their workplace.
   - To ensure that all laboratory workers/visitors clearly understand their responsibilities as defined in this program.
   - To ensure that laboratory workers have received appropriate training in hazard information, safety rules, proper work practices, etc., and also that they have access to a copy of this program.
   - To provide health and safety information, including "Material Safety Data Sheets" for hazardous agents used in their laboratory.
   - To ensure that all containers in their laboratory are appropriately labeled as per the international standards.
   - To ensure that the appropriate safety equipment, such as fume hood facilities, eyewash units, safety showers, fire extinguishers, etc. are accessible, operable, and known to all laboratory workers.
   - To provide and enforce the use of appropriate PPE where there is the potential for exposure to or contact with chemical, biological or physical agents.
   - To ensure that appropriate warning signs are placed in the laboratory.
   - To implement and enforce laboratory safety rules for all laboratory workers and visitors.
   - To provide the proper disposal of hazardous wastes.

3. **Laboratory Workers:**
   - To participate in appropriate training sessions.
   - To be familiar with the hazards and safety procedures for activities involving hazardous work in the laboratory, as well as, information systems, such as MSDS for hazardous chemicals.
   - To be familiar with the labeling requirements.
   - To use the appropriate laboratory safety equipment and PPE.
   - To follow procedures related to the proper disposal of hazardous wastes.
   - To promptly report all accidents/incidents and unsafe conditions to the laboratory supervisor.

iii. The Training and Education of Laboratory Employees and Visitors:

- Before any worker is granted unescorted access to laboratory/technical areas, they shall successfully complete fundamentals of Laboratory Safety training.
- All reasonable efforts shall be made to complete required training before the individual begins work with the material, process or equipment in question.
- All required safety training shall be completed and documented for each worker
- A Laboratory Site Safety Orientation shall be performed by the supervisor on the first day a worker/ visitor is granted access to or assigned work activities in the laboratory.
- Laboratory Site Safety Orientation checklist can be found in Local induction Record form.
- Workers shall attend outside training on the specific additional hazards.
- All laboratory workers must have access to health and safety information, including MSDSs for hazardous materials used in their laboratory
- All laboratory workers must be familiar with the labeling requirements.
- All laboratory workers must be familiar with appropriate procedures for dealing with fires that might break out in their laboratory, spillages of the substances handled in their laboratory and other accidents that have the potential for property damage and/or personal injury.
- Worker training should always include information on safe method for highly hazardous procedures that are commonly encountered by all lab personnel and which involve:
  1) Inhalation risks when using loops, pipetting, making staining, opening culture, taking blood/fluid samples and centrifuge.
  2) Ingestion risks when handling specimens.
  3) Risks of percutaneous exposure when using syringes and needles.
  4) Bites and scratches when handling animals
  5) Handling of blood and other potentially hazardous pathological materials.
  6) Decontamination and disposal of infectious material.

iv. Personal Protective Equipment (PPE):

- Below is the list of the most common PPE needed in a research laboratory:
  - ❖ Body Protection
  - ❖ Eye and face Protection
  - ❖ Hand Protection
  - ❖ Hearing Protection
  - ❖ Respiratory Protection

- **Body Protection**: adds an additional layer of protection for skin and protects area not already covered by clothing such as lab coat and gown

- **Eye and Face Protection**: Face shields must always be worn over safety glasses or goggles, not instead of safety glasses or goggles.



- **Hand Protection**: Disposable nitrile gloves to protect hands from spills and splashes. Do not reuse gloves.

- **Hearing Protection**: Ear plugs and ear muffs provide different protection levels and need to be selected based upon a hazard assessment.

- **Respiratory Protection**: Used to prevent overexposure to an inhalation hazard or irritant where the hazard is not controlled adequately.

- Training must be provided for those who are not use an item of PPE before.
- Worker must wear PPE at all times and it must be fit for purpose.
- Only fully enclosed footwear shall be worn in a lab (sandals, thongs, crocs etc prohibited).
- Use of PPE is the responsibility of the individual (duties of Workers).
- Laboratory coats and/or other appropriate protection must be worn by all workers while working with any hazardous substances in all areas.

- A variety of safety gear such as spectacles and gloves are available from stores and must be worn at any time a biological, chemical or physical hazard exists.
- All PPE must be worn in accordance with manufactures specifications and be maintained in good condition.
- Safety glasses must be worn at all times in the laboratory if identified during the risk assessment process, and must have integral side protection devices.
- Lab coats should be laundered on a regular basis and at least monthly.

v. Labeling and Information:

- Labeling and information must be written for all specimens pose a risk of infection.
- Label must contain:
    - Specimen type and/or source
    - Hazardous Type
    - Preparation Date
    - Research Code
- Labeling and information must be written for all waste including type of waste.

vi. Provide A Written Safety Procedures for Activities Involving Hazardous Work in Each Lab Unit:

- Each Unit in the biomedical science laboratory has their own safety procedure as following:

a. Specific Safety rules and Procedures for Cell Culture Unit.
b. Specific Safety rules and Procedures for Genetics Unit
c. Specific Safety rules and Procedures for Flow Cytometry Unit
d. Specific Safety rules and Procedures for Histopathology Unit
e. Chemical Hygiene Plan (CHP) for general laboratory.
f. Specific Safety rules and Procedures for Animal House

- All files are provided and accessible for all employee.

vii. Waste Disposal Management System:

All potential waste streams that arise from laboratory operations was assessed and disposal route was selected appropriately. The guidelines should be followed in order to minimize risks associated with the disposal of laboratory waste. Main points for consideration are:

- Minimize waste and do not accumulate large amounts in the laboratory.
- Segregate waste - have a separate residue container if you are generating a large amount of any particular type of waste. Ensure the waste container is compatible with the waste you are collecting.
- Label the waste residue container with the appropriate waste label.
- Store waste in the designated space behind the building (the point of generation). Chemicals and solvents should be stored in the ventilated areas (Area-1). Ensure container for biological waste is not leaking and no spillage on the exterior of the container (Area-2). Residue container lids must be secure.
- Handle waste only if you are aware of the hazards associated with the waste and appropriate risk controls are used.
- Record all disposal on Waste Tracking Log to ensure evidence of correct waste management.
- Never mix incompatible waste in the one bin or bag.

1. Chemical Waste

- Definition: A chemical waste is any solid, liquid, or gaseous waste material that, if improperly managed or disposed of, may pose substantial hazards to human health and the environment.
- Examples of Chemical Waste include, but are not limited to:

Unused and surplus reagent grade chemicals	Pesticides
Anything contaminated by chemicals	Ethylene glycol
Used oil of all types	Preserved specimens
Dye and glazes	Degreasing solvents
Mercury containing items	
Non-returnable gas cylinders	
Spent solvents - including water based	

- Bin color yellow base with Orange lid , final disposal method: incineration.

- Sample vials that have been contaminated with hazardous chemicals should be placed directly into a chemically contaminated waste bin or bag.
- Certain chemicals require specific disposal procedures, therefore; use Safety Data Sheet (SDS) to determine recommended waste disposal procedures, for example:
    - ❖ Class 1 (Explosive), Class 4.2 (Spontaneously Combustible) and Class 4.3 (Dangerous When Wet) waste cannot be disposed by regular methods.
    - ❖ Halogenated solvent waste is collected in waste containers, and clearly labeled as halogenated solvent. Halogenated waste must be kept separate to other organic solvents as mixtures can react or even explode (mixtures of acetone and chloroform).
    - ❖ Highly reactive substances such as amines, phosphorus compounds, acetic anhydride, acetyl chloride and reactive metals should never be placed in general disposal containers with other waste.
- Generally chemical waste should be segregated according to its properties :
    - ❖ aqueous acidic
    - ❖ aqueous alkaline
    - ❖ halogenated
    - ❖ non-halogenated
    - ❖ general hazardous waste – powders etc.
    - ❖ toxic
    - ❖ cytotoxic
- If the waste is a liquid, strong plastic containers are approved, sealable containers. The Waste Store can accept only containers up to 5 liters.
- No hazardous chemical substances should be disposed down drains.
- Wash down drains with excess water.

2. Biological Waste

- Definition: infectious waste, pathological waste, chemotherapy waste and the receptacles and supplies generated during its handling and/or storage.
- Biological waste has seven categories:
    1. Liquids such as used cell culturing media, supernatant, blood or serum, which contain viable biological agents.
    2. Materials considered pathological, including any part of the human body, tissues and bodily fluids
    3. Any part of an animal infected (or suspected to be infected)
    4. Non-sharp, solid laboratory waste (empty plastic cell culture flasks and petri dishes, empty plastic tubes, gloves, wrappers, absorbent tissues)
    5. All sharp and pointed items used in medical care, diagnosis, and research, including the care of laboratory animals, which should be considered potentially infectious.
    6. Laboratory glassware which is known or suspected to be contaminated with hazardous biological agents
    7. Any waste mixed with infectious waste that cannot be considered as chemical hazardous waste or radioactive waste.
- Bin color: Bin color: yellow base with yellow lid, final disposal method: autoclave then landfill.

- Materials contaminated with hazardous biological agents must be collected in the appropriate containers and sterilized or disinfected before disposal.
- Disposal Procedures:
    a) Sharp waste: All sharps must be discarded in an approved sharps container. A central laboratories address label must be affixed to each sharps container, treated or untreated, that is placed in the box.

b) Non-sharp: The waste must have been decontaminated by autoclave, chemical disinfection or other appropriate decontamination method.

c) Liquid waste: Collect liquids in leak-proof containers such as flasks or bottles. Also, use of the sanitary sewer for the disposal of liquid wastes. It can be poured down the drain (sanitary sewer), under running water. The sink should be rinsed well and disinfected if necessary.

d) Mixed waste: Follow the formula below to determine which waste stream:
Biological + Radiation = Radiation Waste

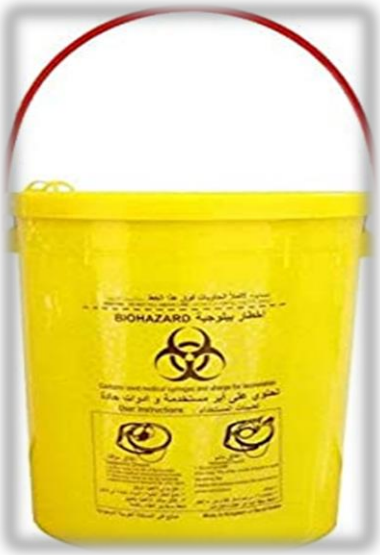
Biological + Hazardous Chemical = Chemical Waste

3. Sharp Waste

- Definition: the term "sharp" is often used as a catch-all expression for any and all sharp or pointed items such as broken glassware, scalpel and razor blades, lancets, hypodermic syringes with needles, etc., which can cause cuts or puncture injuries.
- Sharp waste is subdivided into two categories:
  - **a)** Needle and Blade Waste
  - **b)** Glassware and Plastic ware (and other sharp or pointed) Waste.
- These categories are defined and addressed separately as below:

a) Needle and Blade Waste:

- its hypodermic, surgical, suture, syringes with needles, lancets, scalpels, blades and similar metallic sharp or pointed items for disposal that are capable of causing punctures, cuts, or tears in skin or membranes.
- All needle and blade waste for disposal must be carefully collected in yellow needle and blade waste container.



- The yellow containers for needle and blade waste must not be filled beyond capacity, to prevent injuries due to overfilling. Needles and blades must never be forcibly pushed into a container.
- Needle and blade waste for disposal must not be placed into office garbage containers or plastic bags of solid waste.
- All needles and blades contain blood or body fluid including the manipulation and care of laboratory animals, should be considered potentially infectious.
- Needles and blades pose a risk to those who use them and needle and blade waste may pose a health risk to those involved in its handling, transportation, and disposal.
- Needle and blade waste containing trace amounts of a hazardous chemical must be collected in a yellow container
- All liquids containing hazardous chemicals must be drained from disposable syringes and collected for appropriate disposal.

b) Glassware and Plastic ware (and other sharp or pointed) Waste:

- Glassware, plastic pipettes and micropipette tips should not be disposed of as regular garbage as they can puncture plastic garbage bags and may present a risk of injury.
- Broken glassware, intact small glass containers and tubes, and glass and plastic pipettes must be regarded as potentially sharp and pointed objects and placed into the big yellow container.
- Glassware must not protrude such that the lid cannot be closed.
- Glassware waste must not be placed into regular office garbage containers or plastic bags of solid waste.
- The glassware must be free of biological, chemical or radioactive contaminants and liquids
- Very long or large glassware for disposal that does not completely fit into a yellow container may be placed into a specific container after any necessary disinfection or decontamination. The glassware must be fully enclosed and labeled.

4. Compressed Gas:

- Definition: represents any cylindrical vessel capable of containing a compressed gas at high pressure.
- Compressed gases can be flammable, reactive, oxidizer, corrosive toxic, asphyxiant and cryogenics:

A. **Flammable:** materials that can ignite spontaneously on contact with air at or below a temperature of 54°C**.**

- Flammable gases such as Methane, Ethane, Propane, Butane, Hydrogen, Acetylene, Arsine, Phosphine, Dichlorosilane.

- Do not store near oxidizing agents such as Oxygen cylinders. Unless they are well separated.
- Store away from any readily combustible materials such as paper or combustible fiber

B. **Reactive**: A potentially unstable material which may in the presence of air, water, temperature changes, shock friction, static discharge or contamination release very large or potentially harmful amounts of energy.

- Reactive gases such as Chlorine, Fluorine, Hydrogen fluoride, Hydrogen chloride, Sulfur dioxide.

- Reactive gases must not be stored with other gases.

C. **Oxidizer**: A gas that can support and accelerate the combustion of another material. It is also readily reacts to yield oxygen or other oxidizing agents to promote or cause the ignition of combustible materials.
    - Oxidizer gases such as: Oxygen, Chlorine.

    - Store oxidizing gases in a well-ventilated area away from incompatibles.
    - Never lubricate valves, regulators, gauges or other connections with combustible materials such as oil or handle these parts with oily hands or gloves.

D. **Corrosive**: A gas that causes full thickness destruction of human skin at the site of contact and it has exhibits a severe corrosion rate of aluminum or steel.
    - Corrosive gases such as Hydrogen fluoride, Hydrogen chloride, Sulfur dioxide, Boron Trichloride, Dichlorosilane, Ammonia.

    - Can only be stored in a fume hood, gas cabinet or room.

E. **Toxic**: A gas, which has a lethal dose.
    - Toxic gases such as Arsine, Chlorine, Fluorine, Hydrogen chloride, Sulfur dioxide, Carbon monoxide, Phosphine, Phosgene, Hydrogen sulfide, Nitric oxide, Ethylene oxide, Boron Trichloride, Dichlorosilane.

F. **Asphyxiant and Cryogenics:** A substance or mixture that displaces oxygen in the ambient atmosphere, and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and death.
    - Asphyxiant gases such as Carbon dioxide, Carbon monoxide, Liquid Nitrogen, Sulfur hexafluoride, Noble gases (Helium, Neon, Krypton, Xenon).
    - Provide adequate ventilation for inert gases in storage.
    - Laboratory personnel are required to continuously monitor the level of oxygen in the area where gases are used.

- Accept only properly identified cylinders and do not rely on color codes.
- A leaking cylinder should be removed and isolated in a well-ventilated safe area.
- If the leak is at the junction of the cylinder valve and cylinder, do not try to repair, instead, contact the supplier.
- Properly secure cylinders in a well-ventilated and protected area away from heat, flames, and the sun.
- Mark or tag empty cylinders “EMPTY”
- All compressed gas cylinders must bear labels that clearly identify the contents.
- Do not store flammable gases next to an exit or near oxygen cylinders
- For disposal, return cylinder to the supplier for refill or replace.

viii. Emergency Response

An emergency response covers designated actions employers and employees must take to ensure employee safety from fire, chemical spill or any exposure incident.

Procedures:

Emergencies – General: For emergencies such as fires, explosions, spills or transportation accidents, the basic protocol is:

- Rescue anyone immediately affected by the emergencies only if it does not put you at risk.
- If the emergency involves a fire, activate the alarm and call Civil Defense (998).
- Provide first aid to victims. This includes assisting contaminated staff with the emergency shower or eyewash station.
- Warn others in the area about the emergency by posting a notice, and stay clear of the area. Account for all laboratory staff to ensure that no one was left behind during the evacuation.
- Follow the directions of the Emergency Responders (i.e. Fire Department personnel)

Responsibilities:

A. Supervisor must:

- Ensure that all lab workers have appropriate spill cleanup procedure training.
- Ensure that appropriate Personal Protective Equipment (PPE) is available.
- Ensure that appropriate spill control material is readily available for the hazardous substances used in the work area, and everyone knows how to use it.
- Ensure incident report are recorded. (See Incident form).

B. Laboratory staff and researchers must:

- Attend training.
- Follow appropriate work practices to prevent spills.
- Clean up all incidental spills.
- Notify others, begin evacuation.
- Properly dispose of clean-up material from any incidental response involving hazardous materials

Emergency Plan: emergency plan are prepared and all staff are aware with it. This emergency plan includes:

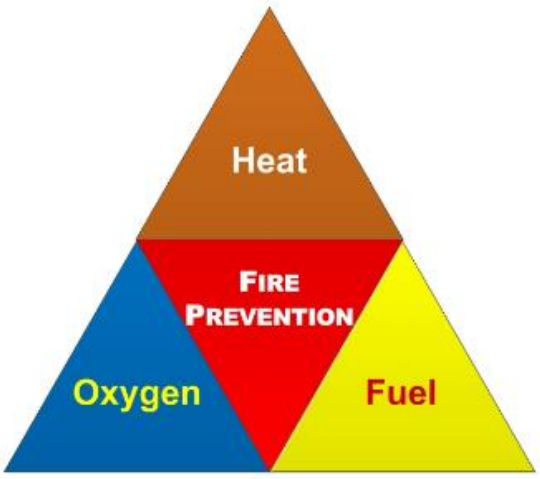
- An inventory that includes the quantities and locations of all flammable, pyrophoric, oxidizing, toxic, corrosive, reactive, radioactive materials, biological materials, and compressed gases.
- Close all hazardous materials containers, and turn off all electrical equipment.
- Fallow the respond emergency procedure (RACE) in event of fire or alarm. (See respond emergency procedure file).
- Recognize location of emergency equipment in the laboratory (fire extinguishers, emergency shower, eyewash, spill kit and fire blanket).
- All staff are required to exit the building when the fire alarm is activated.
- Emergency evacuation route and outside meeting point are posted (see evacuation route plan).
- Instructions not to reenter the building until qualified Emergency Responders provide notification that it is safe to return.

Fire Protection and Prevention

a. Fire Protection:

Fire is a chemical reaction that requires three elements to be present for the reaction to take place and continue. The three elements are:

- Heat and ignition sources.
- Fuel
- Oxygen



These three elements typically are referred to as the fire triangle. The key to preventing fires is to keep heat and ignition sources away from materials, equipment and structures that could act as fuel to complete the fire triangle.

- **Fire Classifications:**

There are six classes of fire: Class A, Class B, Class C, Class D, Electrical, and Class F.

- **Class A fires** – combustible materials: caused by flammable solids, such as wood, paper, and fabric
- **Class B fires** – flammable liquids: such as petrol, turpentine or paint
- **Class C fires** – flammable gases: like hydrogen, butane or methane
- **Class D fires** – combustible metals: chemicals such as magnesium, aluminum or potassium
- **Electrical fires** – electrical equipment: once the electrical item is removed, the fire changes class
- **Class F fires** – cooking oils: typically a chip-pan fire

The following table illustrates the types of extinguishers, fire classes for which each is used and the limitations of each extinguisher:

Type	Class A combustible materials	Class B flammable liquids	Class C flammable gases	Class D combustible metals	Electrical electrical equipment	Class F Deep fat Fryers	Comment
Water	✓	X	X	X	X	X	Do not use on liquid or electric fires
Foam	✓	✓	X	X	X	X	Not suited to domestic use
Dry Powder	✓	✓	✓	✓	✓	X	Can be used safety up to 1000 volts
CO2	X	✓	X	X	✓		safe on both high & low voltage
Wet Chemical	✓	X	X	X	X	✓	Use on extremely high temperature

- **Using Fire Extinguishers**

When using fire extinguishers, employees should employ the "PASS" system of early-stage firefighting:

P—Pull the pin on the extinguisher
A—Aim at the base of the fire
S—Squeeze the handle
S—Sweep at the fire, moving from side to side

- If a fire cannot be extinguished using one full extinguisher, employees should evacuate the site and let the fire department handle the situation.

b. Fire Prevention

Fire prevention are put in place so a building's fire load is as low as it can possibly be. Essentially, fire prevention reduces the likelihood of a serious fire. By safely storing combustible materials, and taking care of points of ignition (such as heating systems and plug sockets), we are reducing the risks associated with fire.

These are guidelines to overall fire prevention:

1. Perform regular risk assessments, and identify the weak areas to improve safety.
2. Identify and resolve deficiencies sources within the lab facility that emit heat or are combustible, flammable, or make the laboratory more susceptible to fire.
3. Large quantities of flammable and combustible liquids must be stored in Safety cabinets.
4. Inspect all electric motors and appliances for exposed wires, broken insulation, improper grounding and improper installation.
5. No smoking rule near storage areas where boxes or containers can easily start a fire.
6. Have appropriate fire extinguishers within easy reach at all times.
7. All employees be trained regularly to use fire extinguishers.
8. Monitoring and improving a fire safety system to reduce disruption and protect staff and visitors.

Spill Control Equipment

A health science research center has spill control equipment. All laboratory staff know where the spill control equipment is kept and instructed on how to use it.

❖ **Biohazard Spills:**

a) Employee Contamination:

1. If the skin becomes contaminated with blood or other potentially infectious materials, wash the area thoroughly with soap and water
2. If blood or other potentially infectious material is splashed into the eyes, immediately use the eyewash station, and flush for at least 15 minutes.
3. Remove grossly contaminated clothing immediately. Place the contaminated clothing in a plastic bag.
4. Report the spill to the Supervisor, and seek medical attention. (see incident report form)

b) Clean Up:

1. Wear the appropriate personal protective equipment (PPE) to clean up the spill. At a minimum, this includes gloves, protective eyewear and a mask, or a face shield.
2. Pick up any broken glass with tongs or some other mechanical device. Do not use your hands.
3. Place absorbent towels over the spill, making sure not to spread the liquid.
4. Carefully pour a dilute bleach solution (1:10) over the absorbent towels. Let this remain for 10 minutes in order to disinfect the spill
5. Carefully pick up the absorbent towels, and place into a plastic bag. Wash the contaminated area again with the bleach other disinfectant. Rinse the area with water.
6. All PPE, towels, and other items that became contaminated must be disposed of a medical waste
7. Wash hands and any other exposed skin with soap and water before leaving the work area.

c) Spills or Breakage in a Centrifuge:

1. Turn off the centrifuge, and allow it to come to a full stop before opening the cover.
2. Wear the appropriate PPE to clean the spill.
3. Remove any broken glass with tongs, and clean the spill as outlined above.

d) Spills in a Biological Safety Cabinet or Laminar Flow Hood

1. Do not shut off the ventilation. The cabinet should be left running to prevent the escape of contaminants. If there is a UV light, leave it on.
2. Wear the appropriate PPE. If the material is infectious, a respirator may be needed.
3. Use a diluted bleach solution (1:10) to disinfect the cabinet. Wipe the walls, work surfaces, and equipment with the disinfectant. Use sufficient amount of a disinfectant to ensure that the drain pans and catch basins below the work surface are disinfected. Let the disinfectant stand for 10 minutes. Wipe the catch basin and drain the disinfectant into a container. Wipe the area with water
4. This procedure will not disinfect the filters, blowers, air ducts, or other interior parts of the cabinet.

❖ **Chemical Spills:**

a) Employee Contamination

1. Contact supervisor to report the spill and request assistance
2. Assist victim with appropriate first aid and move to fresh air
3. DO NOT become contaminated by the chemical as you give first aid. DO NOT try to neutralize any chemical.
4. If the skin becomes contaminated with hazardous materials, wash the affected area thoroughly with copious amounts of water. If available, use the Emergency Shower for at least 15 minutes.
5. If hazardous material is splashed into the eyes, immediately use the eyewash station, and flush for at least 15 minutes.
6. Remove grossly contaminated clothing, including shoes, immediately. Place the contaminated clothing in a plastic bag.
7. File an incident report with your department.

b) Small Chemical Spill Clean Up

1. Any amount of chemical material with a low toxicity or non-flammable, which can be cleaned up by, trained laboratory personnel.
2. Notify fellow workers in vicinity of spill.
3. Secure area by restricting access and posting signs.
4. Wear the appropriate personal protective equipment (PPE) to clean up the spill. At a minimum, this includes gloves and protective eyewear (chemical splash goggles). Depending on the size and type of spill, protective clothing (lab coat and apron), and protective foot coverings may be needed. If high splash potential exists, also wear a face shield over the chemical splash goggles.
5. Shutdown equipment, turn off heating devices and stop any reactions in progress.
6. Review safety information on spilled chemical Material Safety Data Sheet MSDS.
7. Pick up any broken glass with tongs, dustpan and broom, or some other mechanical device. Do not use your hands to pick up the broken glass. Dispose of glass in a sharp container
8. Place absorbent material over the spill, making sure not to spread the liquid. Protect drains – do not allow any spilled material to enter drains.

   - Liquid Spills: Cover spill material with absorbent. Work from outside to center of spill to avoid spreading liquid.

   - Flammable Solvents: Immediately turn off any open flames, heating devices, instrument or machine near the spill that could spark and cause the solvent vapors to ignite. Use plastic scoops and dust pan to clean up absorbent material.

   - Acids: It is not necessary to neutralize an incidental spill. Use absorbent material. Decontaminate area after removal of absorbent. Check pH if possible

   - Alkali Metals: Smother with dry sand. Avoid contact with water.

   -Mercury: Cover with mercury decontaminating powder. Use a flashlight to detect mercury beads that may have spread.

   - Gas Leak: Turn off gas cylinder if possible.

If gas is toxic, corrosive or flammable, evacuate area and call University

9. Clean up spill using a scoop or other suitable item and place material in appropriate disposal container.
10. Decontaminate spill surface with mild detergent and water. Carefully remove PPE, place non-reusable items in disposal container and thoroughly wash hands.
11. Dispose of all contaminated material in a plastic bag. Label the bag with the name of the hazardous material.
12. Investigate cause of spill and review supervisor and document spill.
13. Replenish spill kit.

c) Large Chemical Spill Clean Up

1. These spills must be cleaned up by fire department. DO NOT ATTEMPT TO CLEAN A MAJOR SPILL.
2. Release evacuation of employees in the area
3. Evacuate the area and close all doors. Notify others not to enter the area. Post signs
4. During the evacuation, If possible, shutdown equipment
5. For spills of highly hazardous material or present a fire hazard, activate the fire alarm by pulling the nearest fire alarm box.

ix. Exposure Incident:

An exposure incident is a situation when the eye, mouth or skin is exposed to blood or other potentially infectious material. A potentially infectious material can be considered any fluid such as saliva, semen, blood, or phlegm that has the potential to carry viruses or potentially hazardous material.

The health Science Research Center is committed to providing a safe and healthful work environment for our entire staff. In pursuit of this goal, the following exposure control plan (ECP) is provided to eliminate or minimize occupational exposure in accordance with OSHA standard:

❖ Determination of Employee Exposure:

- Health Science Research Center has determined that all researchers working directly with biological samples and personnel working in laboratories using biological source materials have occupational exposure.
- Additionally, some workers may have a potential for occupational exposure include Research Assistants, Laboratory technicians, Public Safety Officers, housekeeper and Plumbers.

  Therefore, tasks or procedures that would cause occupational exposure are listed to which employees have occupational exposure:

Researcher	Within the normal scope of work.
lab specialist	Within the normal scope of work.
Lab Workers and Assistants	Within the normal scope of work.
Technicians	Within the normal scope of work.
Housekeeping	within the scope of normal procedures as well as emergency cleaning
Plumbers	within the normal scope of work in relationship to sewage
Safety Employee	within the scope of work

❖ **Implementation of Various Methods of Exposure Control, Including Universal Precautions, Work Practice Control, Personal Protective Equipment and Housekeeping:**

- Work practice will be used to prevent or minimize exposure to potential exposure. The specific work practice control used is mentioned in SOP file for each unit.
- PPE is provided to our employees at no cost to them. Training is provided by appropriate PPE for the tasks or procedures employees will perform.
- For any new researcher, employer or technicians Induction Record will be performed. (See Induction form)
- Prohibition of eating, drinking, smoking, applying cosmetics, handling contact lenses, and so on in work areas where exposure to infectious materials may occur.
- Both front line workers and management officials are involved in this process
- Regulated waste is placed in containers, which are closable, constructed to contain all contents and prevent leakage, appropriately labeled or color-coded (see Labels), and closed prior to removal to prevent spillage or protrusion of contents during handling.
- The procedure for handling sharps disposal containers and other regulated waste are provided above.
- Use of leak-proof, labeled containers for contaminated disposable waste.

❖ **Hepatitis B Vaccination**

- Hepatitis B virus can spread through contact with blood or certain body fluids of infected samples. Therefore, it is recommended for hepatitis B vaccine for all workers in lab.
- Employees must be informed of the vaccine's benefits and risks.
- All medical evaluations and procedures for the Hepatitis B vaccine will be available in The Medical Service Center-TU.

❖ **Post-Exposure Evaluation and Follow-up**

All exposure incidents are reported, investigated, and documented. When the employee is exposed to blood or biological sample, the incident is reported to Safety Office. When an employee is exposed, he or she will receive a confidential medical evaluation and follow-up, including at least the following elements:

- Documentation of the route of exposure, and the circumstances under which the exposure-occurred. (Incident Report Form)
- Identification and documentation of the source individual.
- The employee will be offered the option of having their blood collected for testing of the employee's HIV/HBV serological status.
- All post exposure follow-up will be performed by the medical Services Center-TU, All other findings or diagnosis shall remain confidential and will not be included in the written report.

❖ **Communication of Hazards to Employees and Training**

- We make sure that employees are trained at the time of initial assignment to tasks where occupational exposure may occur, and every 2-years
- Information and training, management shall ensure that all employees with occupational exposure participate in a training program cover the following:
    - The standard and its contents.
    - The epidemiology and symptoms of blood-borne, tissues and any biological samples.
    - The modes of transmission of blood-borne pathogens.
    - The recognition of tasks that may involve exposure.
    - The use and limitations of methods to reduce exposure, for example engineering controls, work practices and personal protective equipment (PPE).
    - The types, use, location, removal, handling, decontamination, and disposal of PPEs.
    - The basis of selection of PPEs.
    - The Hepatitis B vaccination, including efficacy, safety and benefits.
    - The appropriate actions to take and persons to contact in an emergency.
    - The procedures to follow if an exposure incident occurs, including the method of reporting and medical follow-up.
    - The evaluation and follow-up required after an employee exposure incident.
    - The signs, labels, and color coding systems.
- Additional training is provided to employees when there are any changes of tasks or procedures affecting the employee's occupational exposure.

❖ **Recordkeeping**

- Medical records shall be maintained in accordance with OSHA Standard. These records shall be kept confidential, and must be maintained for at least the duration of employment. The records shall include the following:
    - The name and TU-ID number of the employee.
    - A copy of the employee's HBV vaccination status, including the dates of vaccination, if possible.
    - A copy of all results of examinations, medical testing, and follow-up procedures.
- All employee records shall be made available to the employee.
- All employee records shall be made available to the Occupational Safety and Health Administration upon request.

Finally, Exposure Control Plan (ECP) and its effectiveness shall review every 2 years and shall update as needed.

Reference:

- Health and Safety Guidelines for the Laboratory- Lynn Montgomery, CPM, CT, HT (ASCP).
- OSHA General Industry Standard
- Common Problems in Clinical Laboratory Management- Judith A. O'Brien.

Department	Title	Date of issue	Date of review	Signature
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